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ABSTRACT

These four presentations provide information on various aspects of the use of the Time-shared, Interactive, Computer Controlled, Information Television (TICCIT) system by Northern Virginia Community College (NVCC). First, Jean C. Netherton provides background on the 10-year history of NVCC's involvement with the TICCIT system and offers information about TICCIT operations, equipment, usage, and acceptance among students. Next, J. Clarence Sasscer refutes the myth that computers in education threaten faculty jobs, arguing that the institution has a great deal of control over the development of computer use in instruction and thus is responsible if jobs are threatened. Then, Monica Sasscer examines two courseware related myths; i.e., computer systems come with courseware and institutions will not have to invest in course development; and creating course materials is easy. Rather, Dr. Sasscer argues, computer-based instruction is a labor intensive, expensive undertaking and that the introduction of the TICCIT system at NVCC brought about problems based on the pedagogical value of the materials developed. Finally, Barbara Wyles confronts the notion that computer-assisted instruction translates qualitative disciplines into quantitative skills, turning humanists into technocrats. (HB)

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NORTHERN VIRGINIA COMMUNITY COLLEGE

COMPUTER ASSISTED INSTRUCTION

A DECADE OF EXPERIENCE IN HUMANIZING THE USE OF HIGH TECH

A Presentation to the American Association of Community and Junior Colleges

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Barbara A. Wyles

JC 840 225

The following are the written notes for verbal presentation to the AACJC convention at the Sheraton Washington Hotel, Washington, D. C. in the Annapolis Room, 10:00 a.m., April 4, 1984.

Panel Chairman:

Dr. Jean C. Netherton, Provost, Alexandria Campus
Northern Virginia Community College

Dr. Netherton, in her previous role as Dean for Instructional Services at NVCC, followed the development of the TICCIT computerized instructional system from its embryonic origins at MITRE Corporation through to its implementation at NVCC.

As the chief administrative officer at the Alexandria Campus she has been instrumental in the development of the TICCIT installation as a teaching tool that pervades the campus instructional operation, as well as the development of large mainframe and microcomputer-supported instruction.

Panelists:

Dr. J. Clarence Sasscer, Chairman
Division of Natural Sciences and Mathematics
Alexandria Campus, NVCC

Dr. Sasscer has worked with the TICCIT system since its inception and was strongly involved in the effort to bring TICCIT to the college in 1972. He has chaired college committees on academic computing and was the director of a National Science Foundation Grant to produce math and science course materials for the TICCIT system.

Dr. Monica Flynn Sasscer, Senior Instructional
Systems Designer, Courseware, Incorporated,
Alexandria, VA

Dr. Sasscer was Director of the TICCIT system through the development and implementation phase at NVCC and was the manager of the academic computing systems at the Alexandria Campus in her position of Learning Lab Coordinator until July of 1983.

Dr. Barbara A. Wyles, Associate Dean for
Curriculum Services, NVCC

Dr. Wyles was part of the original English authoring team for the TICCIT system and coordinated courseware development efforts at the Alexandria Campus in 1979. She has worked as a teacher of English on the TICCIT system.

Presentation by Dr. Jean Netherton

COMPUTER ASSISTED INSTRUCTION--A DECADE OF EXPERIENCE IN HUMANIZING THE USE OF HIGH TECH.

Good Morning! Thank you for joining us for this session. We are particularly pleased that you are here. Not only because it is the final hour of the convention but also because you have confirmed our judgment that we have experienced the use of computers in our instructional program for 10 years and the lessons learned from that experience are valuable to share with our colleagues. What better forum to do that than a National AACJC Convention.

I am Jean Netherton, Provost of the Alexandria Campus of Northern Virginia Community College. I have the honor of chairing our panel presentation this morning and I will introduce the presentors and describe for you the setting of the experiences and lessons we wish to share with you.

Ten years ago, the Alexandria Campus was chosen as one of the two demonstration sites for an NSF funded project with computer assisted instruction. The project involved the development of a mini-computer driven instructional system. The hardware and software were developed by the Mitre Corporation and the courseware was developed at Brigham Young University. The courseware for the project was composed of courses in English and Math. The system

acronym is TICCIT which stands for Time-shared, Interactive, Computer Controlled, Information Television. One of the primary and unique features of the system is the learner control component. The instructional design of the system is quite sophisticated and allows the student several options in determining how the material will be approached and sequenced in the process of learning to a mastery level.

The original project was completed in the fall of 1976 and since that time, the system has been ours to use, to add to, to correct. All of those things we have done, and, the system has become an integral part of our instructional program in many areas. It is safe to say that we would be "lost" without it.

From the past ten years of living with and using the TICCIT system, we have learned many lessons which everyone faces in the implementation of computers in the instructional setting. We are not here to dwell on or sell TICCIT as a special system. We are, rather, to share the universally applicable realities of implementing computers into instruction.

After having stated this, however, let me give you just a few more facts about our particular setup so that you will have a good picture of the extent and scope of our experience.

Let me give you some data and other facts from the TICCIT operations . . .

-- First of all, the larger context into which the CAI operations fit, is that of a large (approximately 11,000 student) urban-suburban campus of a multi-campus institution in Northern Virginia. Our student population mix reflects that of a more urban community.

-- There are 100 TICCIT Terminals located in the LRC/ Learning Lab on the Campus.

-- Other terminals are found in authoring and materials development center; also in the LRC, the total system capacity is 128 terminals.

-- The terminals are composed of a small SONY, colored TV monitor and a keyboard composed of standard typewriter keys, a small panel of 12 keys for mechanical features and a small panel of learner-control, instructional design features.

-- From the original Math and English courseware, there are four full courses--2 courses in English Grammar, Algebra I, and Algebra II.

-- Additional materials include:

1. Instructional Modules for Chemistry
2. Unit Tests and Modules for Biology
3. Unit Tests for Introduction to Data Processing
4. Fundamentals of Music--full course
5. Physics--Instructional modules/practice problems

-- The terminals have always been located in a multi-purpose, open-access lab in the learning resource center.

-- Some student use of the system data during 1982-83 are as follows:

  -- Spring Quarter headcount enrollment across all courses and units = 839
  -- Time online for those 839 was 12,381.7 hours
  -- Time online for other quarters:

     Fall - 23,887

     Winter - 17,635

     Spring - 16,861

     (including authoring, administrative work and demos)

  -- There are two peak times when all terminals are being used simultaneously--mid-morning hours and evening.

-- System performance was over 99%.

-- Student performance can be summarized as follows:

1. Completion rates, overtime, approximately 2/3 at mastery level (Math).
2. Better performance and completion than other forms of self-paced instruction.

-- System Costs

-- Attitude measures, informally taken each quarter, reflect both acceptance and like for CAI as a means of instruction.

Anyone wishing further information on TICCIT, as a specific system, or on more specific performance data, please ask us following this presentation. I only wish here, to give you a picture of the extent of this CAI System and our involvement with it.

What we want to share with you this morning are those lessons we have learned from 10 years of experience with the implementation of the use of computers and those components of the implementation process that relate to the humanizing features--the high touch--features that are so important in the teaching-learning environment. Everyone is facing the explosion of computers and their use in education. We feel fortunate to have been on the early wave of this explosion for the past 10 years. In recent months we have analyzed our particular situation and have realized that, because of our experience, we have had some

small jump on the present computer explosion. This is what we want to present to you. We have chosen to present our experience in terms of the "myths" that are passed around about computers and education and the realities of our situation.

Let me now introduce the panel members who will present several features of our experience. I will introduce them all at once. Following their presentation, we will have a few moments for dialogue, should you wish.

1. The first presentor is Dr. Larry Sasscer, Chairman of the Division of Natural Sciences and Mathematics on the Alexandria Campus of Northern Virginia Community College. Dr. Sasscer has been involved with the implementation of the TICCIT system from the beginning and has worked with his faculty in the management of the instructional environment with CAI. The "myth" he will discuss is "Computers in education are job threatening to the faculty."

2. Our second presentor is Dr. Monica Sasscer, who, until the beginning of this academic year, has provided our campus with leadership and direct supervision of the learning lab in which our academic computing resources are located. Dr. Sasscer also directed a special campus project undertaken immediately after the initial NSF project was completed to bring us up

to full operating level with authoring capability. This year, Dr. Sasscer has been on leave from the college and is working with Courseware Incorporated in Alexandria, Virginia as Senior Instructional Designer. The "myth" Monica will present is "We'll be able to buy packages of courseware and thus have no need to invest in course development" with a sub-myth of "all that is needed is to find money for the hardware purchase."

3. Dr. Barbara Wyles, Associate Dean for Curriculum Services at NVCC, is our third presentor. Dr. Wyles, until weeks ago, has been a member of the English faculty at Alexandria. Dr. Wyles was involved in the initial development of the courseware for the TICCIT project and worked with the development team at Brigham Young University. Since that time she has been teaching the English course on TICCIT and working with courseware revision and development. Dr. Wyles will present the "myth: "Computer-assisted instruction translates qualitative disciplines into quantitative skills and demands that the humanists among us become 'technocrats'."

Wrap Up

To summarize, our experience with TICCIT has been a successful one. We had learned much and have gained some insights in the process of integrating this system into the fabric of the larger instructional component of the campus. Computers are now, in this time, much more a part of the instructional environment than they were 10 years ago. However, the process of implementation lies ahead for most institutions and programs. We are ourselves in the process presently of designing and developing another open access, multi-discipline, academic computing laboratory on our campus. We will house micro-computers and interactive terminals to a mainframe computer. We realize in this new effort that the lessons of our 10 year journey with TICCIT are useful, and we are realizing the benefits.

We hope that our sharing our experience has been of value to you! We appreciate your listening and sharing your time with us.

Thank you!

Questions?

Presentation by Dr. J. Clarence Sasscer

The Myth: Computers in education are job threatening to the faculty.

Reality: Under some circumstances computerized instruction can be job threatening. But an institution has a good deal of control over such circumstances. If a job threatening situation develops, the fault lies with the institution.

Computers cost money. That fact cannot be ignored. The cost, however, may be offset in several ways. Before talking about the offsetting aspect, I'd like to talk about the unpleasant fact of cost itself for a moment.

A computer-based instructional system, be it TICCIT, PLATO, or some other design, contains both machine and human elements. The machine costs vary a good deal with the system and how it is used, but they may include the cost of

- leased or purchased central processors.
- leased or purchased terminals.
- telephone lines and associated controllers.
- software add-ons such as language compilers, special system boards.
- extra memory devices.

- proprietary courseware.
- development of in-house generated courseware (a very high cost item).
- renovation of buildings for air handling and electrical power.
- personnel for installation, for debugging and for ongoing technical support.

Usually in these days, an institution contemplating a computerized instructional system already has computers at work in administrative functions. Things become badly blurred should these systems be mixed. It causes two kinds of problems.

1. The institution is gradually using more and more telephone lines, but it doesn't quite know why. It is buying more and more equipment and seems to be having strange arguments within itself about what kind of equipment should be purchased. It seems to be more and more shorthanded technically, and more gripes and complaints are heard about the wrong sorts of people making academic decisions.
2. When super highways are built, they usually seem to have a great surplus of capacity. Use begets more use, however,

> and soon they are inadequate. This seems to fit analogically in computer systems. What was thought to be immense capacity becomes voraciously consumed. In the mixed administrative/academic arena, however, the clear and universal loser is academic computing. Such things as registration must go on, no matter what. Statistical reports must pop up on time. Adminsitrative priorities overwhelm the situation.

TICCIT is an example of a situation where this mixing of function and consequent loss of clearcut accounting does not occur because it can't. TICCIT is a computerized learning system and it is entirely, but only, that. It doesn't handle business and office functions, is not a good statistical tool in its own right, and doesn't even use the increasingly costly communication links associated with telephone lines. On the TICCIT system, the costs are very apparent as separate line items in a budget. It is important that such costs are not buried, not blurred with other accounts. It should be possible to pull together an accurate cost figure so that in instructional planning and in instructional cost accounting you know where you stand.

Next, how does staring the figure in the face help you in preventing the myth from becoming a reality?

Let's talk about what things may look like on balance.

- With a computerized learning system, it is possible that you may have a money-maker on your hands. Once you have made your investment, your instructional system may crank out more student enrollments per dollar invested than anything you have ever done. TICCIT presently does this in math. The faculty member managing the system handles three times as many students as otherwise, and the quality of instruction is superior in several respects.
- On the other hand, your system may be an equal cost alternative for your students. It may not be a money-maker, but it may not cost any more than some other more usual approach.
- Your system may be a very expensive add-on to a usual mode of instruction. Math on TICCIT started out this way, and all other uses still function this way. Sections are sorted out with one teacher and 20 some odd students--but the computer is a part of the picture in

what otherwise might be a course with only a chalkboard as an instructional assist.

In summary of this point about basic cost-effectiveness, it should be mentioned that you have to set up a particular design in your own situation and then carefully analyze it. There are not categorical answers. In some instances you may be able to choose from a variety of possible constructs; in some others, you will not have that kind of control. For instance, in TICCIT Math we were able to make a major shift in instructional strategy and staffing, changing it from an economic handicap into a money maker. In TICCIT English, at least up to this point, we have not.

Somewhat independent of these things, you may wish to consider putting in a computer-based instructional system because it

- offers the possibility of individualizing instruction to the needs of the student, taking him only through the mix of bits and pieces that he particularly needs.
- computer-based instruction may allow the student to move along at his own pace, spending as much time as he individually needs on one topic or another.

- a computer-based system may offer new modes of instruction impossible to contemplate otherwise. For example, there is a TICCIT program in which the student hears tones and identifies them as notes. It requires no piano, no studio, no endless hours of instructor time, and allows infinite variation and as much practice time as the student wants or needs.
- a computerized system may relieve student problems in terms of hours-in-the-day scheduling of classtime or of test time. This allows the student to set his own day-to-day schedule, or avoid several tests in any one day. It also relieves the institution in terms of scheduling a multiplicity of sections for student benefit.
- a computerized system may allow the learner varying amounts of control, allowing him to select modes of learning or patterns of learning that are a best fit for him individually.
- a computerized system may open up new markets, if we may use such a crass term. Sometimes, as in the case of aspects of data processing, the costs may be enormous, but the college may

need to be able to respond to a community need. Knowing the cost is critically important, however, because you need to know what you are doing to yourself when you make these decisions.

. Finally, a computerized system may deliver a level of quality that is unmatched by any other alternative. As an example, TICCIT math won't let you out with less than a "B". Mastery is set at that level. Further, no matter how many "snow days", the student is not finished until all the units are done. Subject matter is uncovered. not just covered, and the only press for time is that which the student senses for himself.

So far, I have suggested that there may be a number of roads you can travel with computerized instruction, and some of them may be brand new avenues for you. I have further suggested that you need to know how much wherewithall you will need to make the trip, so you can decide whether or not you can afford it, or whether perhaps you can't afford not to go.

Back to the "myth." As you can see, there are many different things one can do, and several shapes things can take in terms of cost effectiveness. Can you be boxed into

a situation in which computerized instruction is job-threatening?

The answer is "Yes, it is possible."

As I see it, there are two things that can happen; two things that one can decide to do that are likely to make a faculty very unhappy.

1. In a time of stable or declining enrollment you can put in a computerized system that must pay for itself in student enrollment, or worse yet, put in one that is set to be a money-maker. That can be job threatening.

   The proposition simply sits there and stares at the faculty. If the system comes in, some people have got to go.

   TICCIT came to us as an experiment in quality education at a time of growth in college and was not job threatening. Today we are suffering a slight enrollment decline. If the college determined that the quality added was worth the cost, putting the system in as an add-on to full staffing would not be job threatening. If the system had to break even in cost by producing extra student enrollments, it would indeed be job threatening.

2. You cannot add a computerized alternative to instruction if the faculty is not prepared to buy in--even in the best of circumstances. They must be interested in a very different style of instruction, one in which the system does much of what they formally did. Otherwise it just won't succeed. It will be found that students will have too much trouble with the keyboard. Response time will be unsatisfactory. Teaching algorithms will be too simplistic, too flawed, any number of problems will be found.

The bottom line is that computerized instruction is job threatening when the institution allows it to become so. Computerized instruction works and works well when the right faculty feel positive about using it.

Presentation by Dr. Monica Sasscer

The Myths: 1. "The system comes with courseware."

2. "Creating your own course materials is easy!"

These two courseware related myths were part of the scene in 1973 when we first got involved with the TICCIT system. They are very much a part of the characteristic propaganda for computer based instruction today.

The reality is not that simple. TICCIT was delivered with a unique set of course materials in basic mathematics and English grammar. I say, unique, because they were intended to be, and in fact were extensive enough to be, entire, stand alone courses. It was expected that the computer delivered course could replace, or rather be an alternative to, a full term's course in those subjects. Unfortunately, the materials turned out to be seriously flawed and required extensive revision. They also suffered from another malady: the "not invented here" fault. Ten years later, much of the courseware offered commercially is prone to the same ills. The problems are not so much with technical bugs but with teachability features--is the material designed in accordance with sound pedagogical theory and practice? And even if it is, it may not be the way "we teach" that concept!

The solution seems obvious, users should develop their own materials. And then we face the reality behind the second myth: authoring for CAI is "easy" . . . Perhaps it depends on one's definition of easy. Let me share what we have learned in our ten years of experience with revising existing materials and writing new materials for delivery by the TICCIT system.

I'll start with some definitions. The TICCIT system was designed to be used entirely and exclusively for instruction and training. The operating software is written to maximize the hardware's ability to handle student interactions with a maximum of flexibility and "friendliness." The instructional materials are referred to as the courseware or lessonware. These materials have to be placed on the computer by means of a language or system designed to interpret the author's instructions and the students' responses. We can identify three means of doing this:

1) The author can be (or learn to be) a programmer of computer languages, such as BASIC or PASCAL. In fact, most early development of CAI was carried out in this manner as is commercially produced courseware.
2) The computer's designers can make available what is known as an "authoring language", i.e., a higher level code designed for use by

instructional developers. Authoring languages are not programming languages, but they require similar skills.

3) Another option is the use of an authoring system. This method is designed to facilitate course writing by non-programmers. It is often form-driven or question-driven. The author is prompted by the computer with a series of questions or format options which are already programmed to behave in a specific manner.

During the 1970s, the only option for authoring for TICCIT was to use its authoring system, APT. While it does not require programming ability, it takes time to learn. More importantly, it suffers from the limitations of all authoring systems: it limits the instructional design options. In other words, it forces the author to follow a particular method of presentation and branching and does not fully exploit the capabilities of the computer. For TICCIT, this meant that all courseware was of the RULE, EXAMPLE, PRACTICE variety. It was, however, designed to allow students maximum control over the use of those options.

TICCIT now has an authoring language, called TAL, which enables the course designer to make his own decisions about lesson format and branching options.

In the early years, if these users, the faculty of the Northern Virginia Community College were going to write (or revise) courseware, they would have to learn APT. Three full time faculty and two instructional assistants were given release time for one year to learn to author, and to revise the dozens of math and English lessons that didn't "work," wither technically or pedagogically.

This was in the 1976-77 academic year. Since then, these same faculty members have been granted varying amounts of release never full time, to further improve the existing courseware and to develop new courseware. The instructional assistants, who became instructional design technicians, were classified staff and assigned to the task full time. This was one investment made by the campus staff which was above ordinary guidelines. It turned out to be well worthwhile and allowed for more efficient use of faculty in the process.

Against this background, I would like to share with you some of the things that we learned about developing CAI courseware in-house.

. There are at least three different skills involved in the production of computer-based instruction:

1) systems design skills,
2) subject matter expertise and
3) system specific computer authoring skills.

. Teaching faculty possess the subject matter knowledge. Few of them are trained in systems design. Without this skill, the process tends to be ill defined and results in frustration on the part of all involved. It takes more than subject matter expertise to be a good teacher. It takes certain other skills for good teachers to write textbooks. And it takes more than teaching expertise to design CAI lessons.

. Authoring skills involve such things as the display specifications, the branching decisions, the anticipated responses and feedback specifications as well as the rules for communicating these to the computer. Few teaching faculty are interested in acquiring these skills. Those who are willing, do not want to do it full time. And once they learn the skill, they find that unless they keep using them, they are quickly forgotten. All this has implications for the way resources can be allocated for instructional development.

. A team approach to the development of CAI is an efficient and effective way to accomplish the task within the constraints of a teaching institution that does not have an R & D budget nor handy graduate assistants. Para-professional classified staff were trained in those aspects of authoring that involved putting the materials on line.

They became excellent resources, and as they gained experience, took on more consultative roles. They were also hired away by the TICCIT's company, Hazeltine.

. Faculty who wished to develop lessons in their discipline were given 20-40% release time to work with a faculty member who had the authoring expertise and with an authoring technician (the staff person). As the lessons began to take shape, a review team of colleagues critiqued the material and provided feedback to the administration as to the progress of the project. This method had a dual purpose: it assured some measure of quality control and it was an attempt to create some "ownership" among faculty in the same department in order to encourage them to use the CAI lessons in their own teaching.

. The development of computer based instruction is a labor intensive, expensive undertaking. The average cost of one hour of instruction, in our experience, is between 90-100 hours of development. This figure has held fairly constant for the past six years. Some of the payoffs were discussed by the previous speaker. There are others, among them is the potential for creating lesson materials, perhaps even a whole course, which could fill a very necessary gap in the curriculum but which, for a variety of reasons, cannot be offered frequently enough by a department.

One that comes to mind is the course in The Fundamentals of Music which was developed by a team at our campus led by Dr. Carolyn Dressler. The music program at a community college attracts a wide variety of novice as well as experienced musicians to its theory courses. They are typical of our population in every way--employed adults, seeking enrichment or additional career skills, who have been playing a musical instrument for a period of years, etc.--and tend not to believe that they need to go back to the basics. The computer based course, complete with audio to practice the scale, has been a successful solution. Students don't perceive that they are wasting time in a prerequisite (since they can enroll concurrently with the theory course) and the faculty don't waste time reviewing basics in an advanced level course. Furthermore, the TICCIT course is managed by the theory teacher since it is almost entirely self-instructional. This is an example of one of our successes.

In summary, we caution you to look carefully at any computer instruction systems that assure you they come with lots of courseware. Be sure your faculty will find it acceptable if it does exist. And if you're planning to develop your own, be prepared to dedicate the costliest resources to the project: time and technical expertise.

Presentation by Dr. Barbara Wyles

The Myth: Computer-assisted instruction (CAI) translates qualitative disciplines into quantitative skills and demands that the humanists among us become "technocrats."

The reality is that those sensitivities more traditionally associated with the humanities, here specifically English (language and literature), actually become a more integral part of CAI than in the traditional classroom. Some of these sensitivities include: an emphasis on the individuality of the student; respect for his or her individual needs; those non-behavioral, unmeasurable skills, i.e., understanding, appreciation of literature, emphases which teachers of the humanities have always held up as the fabric of a society that endures.

First, the classroom setting itself is more "personalized." The teacher sees the "person," almost exclusively on a one-on-one basis, rather than approaching the class as a whole. As a result, the teacher learns to know the individual student, his or her strengths, needs, and to a certain extent, his or her learning strategies. As the teacher, you learn to personalize your "teaching"

approach to each student, learning rather quickly which approaches are effective and which are not. The teacher is free in this kind of setting to encourage students by giving them immediate commentary on their progress.

Second, the pedagogy, while dictated by the presentation on the screen, relies on the support and coordinant intervention of the teacher. Here the teacher's role becomes predominantly "nurturant." The teacher becomes a counselor, often offering personal as well as academic support; the teacher becomes a confidante. The teacher represents an ally, working in a variety of ways, to witness the student's successful completion of the course; the teacher is most importantly still a teacher, clarifying material, expanding or revising examples offered, helping to insure a "match" between type of presentation of material and kind of student working with that material, anticipating the specific needs of each student. The teacher also becomes, at times, a "mediator" between student and machine. Frequently, the student new to CAI sees himself in an adversary role in respect to the machine; he senses a contest of wits, his against the machine's, perhaps even an attempt on the part of the computer to "trick" him through rhetoric or a shift in pattern of presentation, hence pattern of expectation. The teacher has to monitor and "defuse" this kind of situation, often either by talking the student through or pacing the student through some of the material.

Third, and equally as important, is the need for the teacher to be informed, to know what material is being presented, and through what kind of format that material is being "taught." The teacher becomes a "technocrat" and the material becomes inappropriately quantitative only when the teacher "opts out" of the process, the teaching-learning system, thereby allowing "technicians" to bend or mold material (never meant to be set to the rigors of quantification) to fit a particular format. What results is a literature course that attempts to teach Beowulf by asking the student to count the number of kennings in a given passage, or a course in poetry that pleads an instructional goal of teaching the student to appreciate a poem through the behavioral response of marking examples of alliteration and assonance.

It is the teacher who must represent the ameliorating voice here, who must determine what material can be effectively--and appropriately--taught through this method of instruction. Clearly, CAI is but one system through which instruction can be delivered, but "the system does not make the man (or woman);" hence, the process need not dictate that its users, teachers and students, become technicians. However, only an informed involvement in the process will promise a knowledge of the material sufficient for making such decisions about appropriateness of method for material. An article in the March issue of Newsweek,

"The High-Tech Payoff" (1984: 4-7), discussing career prospects in high technology for the nineties, states: "Two traits that have distinguished artists in the post-industrial age are high unemployment and deep disdain for technology." Relating this observation to all teachers of humanities, and without commenting on any possible cause-effect relationship between these two observations, aloofness from and disdain for any instruction carrying the "taint of technology" is ultimately as much a violation of the teaching-learning process as a refusal to review a textbook which becomes, nevertheless, the main method through which particular course material is presented.

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